

A Multidisciplinary Investigation of a Deep-water Gas Hydrate Mound, Atwater Valley, Northern Gulf of Mexico

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Natural marine gas hydrates exist on the seafloor of the continental slope of the northern Gulf of Mexico, but in spite of extensive geological and geophysical data, little is certain regarding their subsurface distribution and concentration and traditional geophysical indicators (e.g., bottom simulating reflections) are rare. This has motivated numerous ongoing hydrate studies, including the Gulf of Mexico Gas Hydrates Joint Industry Project (JIP), a collaboration among industry, academia and government agencies. Two goals of the JIP are to better understand the physical system and the seismic reflection characteristics of gas hydrates and free gas associated with surficial gas hydrate mounds. In the Atwater Valley region of the Mississippi Canyon, 150 km south of Louisiana, at about 1300 m water depth, there are several seafloor mounds that may be active vents with significant accumulations of gas hydrate adjacent to the gas and fluid migration pathways. Several recent research cruises, led by the U.S. Geological Survey, the Naval Research Laboratory and the Woods Hole Oceanographic Institute, have investigated this site and collected high-resolution seismic reflection data, piston cores, heat flow measurements, electromagnetic readings, near-bottom photographs, side-scan sonar and multibeam bathymetric data. Additionally, the JIP has 3-D seismic coverage of the area provided by WesternGeco.

A shallow, convex-upward reflection in seismic profiles over the largest of the seafloor mounds (Mound F) and high heat flow and chloride concentrations indicate that the base of the gas hydrate stability zone is anomalously shallow beneath the mound. High seafloor reflectivity observed over the mounds on the seismic profiles is indicative of hydrate or authigenic carbonates at or near the seafloor. Bottom photographs show evidence of mud flows from the flank of Mound F. A drilling and coring program planned by the JIP for spring 2005 will provide ground truth for present interpretations and theoretical models while providing quantitative estimates of subsurface hydrate deposits near Mound F.

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